

INCH-POUND

MIL-W-3459D

18 April 1990

SUPERSEDING

MIL-W-3459C

31 March 1978

(See 6.11)

MILITARY SPECIFICATION

WIPERS, WINDOW, ELECTRIC, PENDULUM TYPE (MARINE SERVICE, HEAVY DUTY)

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the general requirements for the design and construction of single or multiblade electric window wipers for surface ships.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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SPECIFICATIONS

FEDERAL

- FF-B-171 - Bearings, Ball, Annular (General Purpose).
- QQ-A-591 - Aluminum Alloy Die Castings.
- QQ-A-596 - Aluminum Alloy Permanent and Semipermanent Mold Castings.
- QQ-S-763 - Steel Bars, Wire, Shapes, and Forgings, Corrosion Resisting.
- PPP-F-320 - Fiberboard; Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes.

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- MIL-M-14 - Molding Plastics and Molded Plastic Parts, Thermo-setting.
- MIL-S-901 - Shock Tests, H.I. (High Impact); Shipboard Machinery, Equipment and Systems, Requirements For.
- MIL-E-917 - Electric Power Equipment, Basic Requirements (Naval Shipboard Use).
- MIL-E-2036 - Enclosures for Electric and Electronic Equipment.
- MIL-C-2212 - Controllers, Electric Motor A.C. or D.C., and Associated Switching Devices.
- MIL-L-3661 - Lampholders, Indicator Lights, Indicator-Light Housings, and Indicator-Light Lenses, General Specification For.
- MIL-L-3661/8 - Housings, Indicator-Light, Style LH76.
- MIL-L-3661/14 - Lenses, Indicator-Light, Dripproof, Style LC14.
- MIL-T-7928 - Terminals, Lug: Splices, Conductor: Crimp Style, Copper, General Specification For.
- MIL-P-15024 - Plate, Tags and Bands for Identification of Equipment.
- MIL-P-15024/5 - Plates, Identification.
- MIL-C-15726 - Copper-Nickel Alloy, Rod, Flat Products (Flat Wire, Strip, Sheet, Bar, and Plate) and Forgings.
- MIL-E-16400 - Electronic, Interior Communication and Navigation Equipment, Naval Ship and Shore: General Specification For.
- MIL-M-17185 - Mounts, Resilient; General Specifications and Tests for (Shipboard Application).
- MIL-M-17191 - Mounts, Resilient; Portsmouth Bonded Spool Type.
- MIL-M-17508 - Mounts, Resilient; Types 6E2000, 6E900, 6E900BB, 7E450, 7E450BB, 6E150, and 6E100.
- MIL-E-17555 - Electronic and Electrical Equipment, Accessories, and Provisioned Items (Repair Parts): Packaging of.
- MIL-M-17556 - Motor, Direct-Current, Fractional HP (Shipboard Use).
- MIL-W-18445 - Windows, Non-Icing, Laminated Flat Glass, Electrically Heated with Controls.
- MIL-L-19140 - Lumber and Plywood, Fire-Retardant Treated.

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- MIL-M-19379 - Mounts, Resilient, Mare Island Types 11M15, 11M25, and 10M50.
- MIL-M-19863 - Mount, Resilient: Type 5B5000H.
- MIL-C-20159 - Copper-Nickel Alloy Castings (UNS No. C96200 and C96400).
- MIL-M-21649 - Mount, Resilient, Type 5M10,000-H.

STANDARDS

FEDERAL

- FED-STD-601 - Rubber, Sampling and Testing.

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- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-167-1 - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).
- MIL-STD-252 - Classification of Visual and Mechanical Defects for Equipment, Electronic, Wired, and Other Devices.
- MIL-STD-454 - Standard General Requirements for Electronic Equipment.
- MIL-STD-461 - Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference.
- MIL-STD-462 - Electromagnetic Interference Characteristics, Measurement of.
- MIL-STD-740-1 - Airborne Sound Measurements and Acceptance Criteria of Shipboard Equipment.
- MIL-STD-794 - Parts and Equipment, Procedures for Packaging of.
- MIL-STD-810 - Environmental Test Methods and Engineering Guidelines.
- MIL-STD-1399, Section 300 - Interface Standard for Shipboard Systems, Electric Power, Alternating Current.
- MIL-STD-2073-1 - DOD Materiel Procedures for Development and Application of Packaging Requirements.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

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AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

S1.4 - Sound Level Meters, Specification for.

S1.11 - Specification for Octave-Band and Fractional - Octave-Band Analog and Digital Filters.

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.5) in accordance with 4.3.

3.2 Construction.

3.2.1 General construction. Wiper system shall consist of a totally enclosed drive mechanism, with apparatus for cleaning the exterior surface of windows and windshield glazing, and shall also be fitted with the necessary devices and controls to actuate and arrest operations (see 6.3). Component parts of the wiper system shall consist of a motor, drive arm assembly, connecting linkage mechanism, control provisions, and blade assembly. The wiper system shall be driven by a motor actuated by a conveniently located control unit to operate the wiper by which the operator may vary the frequency or speed of the wiping cycle. Each wiper shall have a separate control unit that shall provide two or more frequencies or speeds of continuous operation. The systems shall be constructed so that no parts will work loose in service. The control unit, when energized, shall operate the wiper, a heated arm, and a blade assembly that will follow a pendulum motion. Wipers shall be fitted with a mechanical linkage to maintain the blade in a vertical position throughout the arc travel if required. Each part shall be built to withstand strains, jars, vibrations and other conditions incident to ship motion or environment.

3.2.1.1 Materials. Parts exposed to the weather shall be made of 90-10 copper-nickel alloy in accordance with MIL-C-20159 or MIL-C-15726; or for arms and stuffing tube, corrosion-resisting steel in accordance with QQ-S-763, class 316. Drive mechanism housing shall be aluminum in accordance with QQ-A-596, alloy number A356 or 513 or QQ-A-591, alloy number A360. Phenolic molding compound (MIL-M-14, type CFI-40) may be substituted when specified for "interior use only". Dissimilar metals in contact with each other and the environment shall be compatible as defined in MIL-E-16400. Plastic sleeves and separators for penetration in ship's structure shall be provided to eliminate electrolytic corrosion between dissimilar metals in windshield wiper system and ship's structure. Spur and worm gearing shall be of steel conforming to QQ-S-763, class 316.

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3.2.1.2 Recovered materials. Unless otherwise specified herein, all equipment, material, and articles incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified.

3.2.1.3 Protective treatment. Materials used in construction of windshield wiper systems that are subject to deterioration when exposed to climatic and environmental conditions likely to occur during service usage, shall be protected against such deterioration in a manner that will in no way prevent compliance with the requirements of this specification. Metals that are not inherently corrosion-resistant, as defined in MIL-E-917, shall be processed (treated, plated, or painted) in accordance with MIL-E-917 to provide corrosion resistance protection adequate to prevent deterioration. The use of any protective coating that will crack, chip, or scale with age or extremes of climatic and environmental conditions shall be avoided.

3.2.1.4 Orientation. Components of the drive system shall operate in any position or angle.

3.2.1.5 Interchangeability. In no case shall parts be physically interchangeable or reversible unless such parts are also interchangeable or reversible with regard to function, performance and strength.

3.2.1.6 Weight. Weight of a complete single blade wiper system shall be minimized and shall not exceed 25 pounds. Weights of additional components necessary for multiblade systems shall be consistent with the weight of a single blade wiper system.

3.2.1.7 Dimensions, size. Wiper drive housing assembly, envelope dimensions, and mounting holes shall conform to the dimensions shown on figure 1. Control box, envelope dimensions, and mounting holes shall conform to the dimensions shown on figure 2.

3.2.2 Vibration. Wiper system shall conform to the type I vibration requirements of MIL-STD-167-1 (see 4.6.12)

3.2.3 Shock. Wiper system shall conform to the grade B shock requirements of MIL-S-901 (see 4.6.13)

3.2.4 Airborne noise acceptance criteria. Wiper assembly shall be constructed so that, when operating, the assembly meets the requirements for grade A3 equipment in MIL-STD-740-1 and table I (see 4.6.14.3).

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TABLE I. Airborne noise acceptance sound pressure levels dB.

Sound pressure level ref. 0.0002 microbar									
Center frequencies of standard octave bands, Hz									
32	63 <u>1/53</u>	125 106	250 212	500 425	1000 850	2000 1700	4000 3400	8000 6800	SIL <u>2/</u> Value
87	81	76	73		<u>3/</u>		66	65	61

- 1/ These center frequencies are for use with octave band filter sets whose center frequencies do not conform to the ANSI S1.4 preferred numbers, but instead conform to ANSI Z24.10.
- 2/ Speech interference level.
- 3/ The arithmetic average of the level in these three bands shall not exceed 61 decibels (dB).

3.2.5 Electromagnetic interference (EMI) reduction. Each wiper unit shall meet full MIL-STD-461 requirements for class A4 equipments except as modified herein:

RS-03 limits shall be 200 volts per meter in the frequency range of 2 to 30 megahertz (MHz).

CS-02 testing shall apply to all power interconnecting, control and signal cables that are unshielded or are to be installed with single point grounding. Between 2 to 30 MHz the equipment shall be subjected to common mode coupling to 12.25 volts or 3 watts from a 50-ohm source.

3.3 Mechanical equipment.

3.3.1 Wiper drive assembly housing. Wiper drive housing assembly (motor reduction gear and operating mechanism) shall be for mounting either on the inboard (interior) or outboard (exterior) side of a ship's deck house structure as specified (see 6.2). Inboard units, phenolic (see 3.2.1.1), shall be marked "for interior use only". Wiper motor, filter, angle drive, or other linkage mechanism shall be contained within the housing assembly. Outboard unit housing shall be weathertight with ventilation tubing. Cover of housing assembly shall be removable and, when removed, shall expose all electrical and mechanical components. Electrical leads and components shall not be attached to cover of housing. For electrical connection to cable from control box, a phenolic housing shall be provided with a metal insert threaded 3/4-inch nominal pipe size (nps), conversely, a metal housing shall have a threaded hole this size. In either case, the threaded hole shall be sealed with a removable protective plastic cap having a push-in or screw thread configuration.

3.3.2 Installation and mounting. Inboard mounted drive assemblies shall only require one penetration hole. Wiper output shaft containing arm heater for attaching blade assembly shall pass through a single hole 1.375 inches nominal in diameter. A metal stuffing tube assembly capable of being attached to ship's

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structure by means of a locknut shall be provided. Stuffing tube shall be so packed and sealed to allow drive arm to rotate smoothly yet not allow water to enter ship's interior. Three mounting legs shall be provided and attached to wiper drive assembly housing. Wiper housing shall be provided with means for mounting housing assembly, above or below designated windows.

3.3.3 Drive system. The output drive shaft through mechanical linkage shall rotate in alternate directions so that it will cause drive arm to travel through reciprocating angle stroke. Stroke angles shall range from a minimum of 41 degrees to a maximum of 0 degrees. A separate mechanical converter shall not be used for obtaining a reciprocating blade motion.

3.3.4 Drive arm assembly. A wiper drive arm shall be provided to transmit drive shaft motion to the wiper blade. The upper wiper arm shall contain an encased electrical heating element. Means shall be provided for attaching and removing lower wiper arm assembly when required. When wiper assembly (drive mechanism) is mounted inboard and wiper drive arm assembly penetrates ship's structure, means shall be provided for replacing upper arm assembly without removing wiper assembly from its mounting. An angled drive arm may be used to provide better visibility, less noise during operation, and shall not obstruct field of vision when the wiper arm and blade are parked.

3.3.4.1 Lower wiper arm assembly. Unless otherwise specified, a lower arm assembly constructed from material as specified in 3.2.1.1 shall be provided (see 6.2). Lower arm assembly will transmit motion of upper drive arm to blade assembly. Lower arm shall be supplied with an approximate overall length of 20 inches, including all hardware (see 6.3).

3.3.4.2 Blade action. The size and motion of the blade shall be able to wipe approximately 40 percent to 75 percent of the window glass. The wiper blade shall be held against the window by adjustable spring tension. Blade pressure shall be adjustable from 1 pound minimum to 3 pounds maximum. Means shall be provided to prevent the wiper blade and arm from interfering with the opening and closing of the window. When the window is opened it shall be possible to extend wiper arms outward without mechanical damage.

3.3.4.2.1 Blade assembly. Each wiper shall be provided with one straight back blade assembly with an overall length of 12 inches. Unless otherwise specified, blades of other lengths, for example 6, 8, 10, 14, 16 inches, and so forth, shall be provided if required (see 6.2). The wiping edge of the blade shall be formed of a neoprene rubber material having inherent resistance to the salt-sea environment conditions as well as resistance to the effects of ultra-violet rays of the sun (see 3.5). Wiping edge of blade shall not soften or stick to glass while under a maximum pressure of 8 pounds and surface temperature of glass is at 140 degrees Fahrenheit (°F). Blade material shall be such that no scratching, abrasion, or other damage to the windshield surface will occur as a result of operation of the windshield wiper system.

3.3.4.3 Clevis bracket. A clevis bracket shall be used to join the blade to the wiper arm. The clevis bracket shall rotate 360 degrees and lock at any angle selected. The clevis bracket shall not work loose during operation of wiper due to environmental conditions encountered. Use of quick-clip for attaching blade to clevis bracket shall be avoided. The blade, when attached to clevis bracket, shall have freedom of motion in a direction parallel to bracket.

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3.3.5 Stroke speed. Wiper shall operate between a "slow" speed of 140 and a high speed of 240 strokes per minute by means of a variable powerstat switch. This shall be applicable to all lengths of drive arms and blade sizes. A stroke will be considered as motion of the wiper blade across the area of sweep from one extreme position to the other.

3.3.6 Travel adjustments. A travel adjustment shall be provided for adjusting angle of sweep from a minimum of 41 degrees to a maximum of 70 degrees. There shall be a minimum of 10 angular adjustment positions. Travel adjustment shall not require removing installed wiper from ship's structure.

3.3.7 Centering of wiper blade arm. Wiper blade arm shall be centered or placed in a bias position in relationship to sweep configuration. Wiper drive assembly housing cover, when open, shall provide access to adjustment for centering blade.

3.3.8 Glareproofing. Parts exposed to view of ship personnel shall be finished in such a manner as to eliminate reflections into the visual field of the personnel.

3.3.9 Multi-wipers. Two or more complete wiper drive assemblies may be installed on large size windows. A single wiper drive assembly may operate a remote or slave unit by means of a connecting rod. Remote or slave wiper unit shall confine itself to window on which drive unit is installed.

3.3.10 Bearings. Bearings shall be grade 50 in accordance with FF-B-171, sealed, and permanently lubricated.

3.3.11 Gears. Gear assemblies shall be properly aligned and meshed and shall be operable without interference, tight spots, loose spots, or other irregularities. Where required for accurate adjustments, gear assemblies shall be free from excessive backlash. Gears fitted on shaft shall be secured thereto by means which will effectively prevent relative motion between gear and shaft.

3.4 Electrical equipment. Electrical design, processes, safety, and fabrication shall be in accordance with MIL-E-917 except as specified in this specification.

3.4.1 Motor. Motor design shall be in accordance with MIL-M-17556 and shall have the following characteristics:

Rating	1/8 horsepower (hp), output at 3600 revolutions per minute (r/min) maximum
Voltage	115 volts, direct current (dc)
Winding	Permanent magnet
Speed classification	Adjustable
Enclosure	For inboard mounting - ventilated For outboard mounting - weathertight
Bearings	Ball, sealed, and permanently lubricated
Service	C
Insulation	Class B, F, or H

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NOTES:

1. A metal plate on motor shall contain above information and indicate direction of rotation. The plate shall be installed on motor where necessary for proper function of the equipment.
2. Filters for EMI shall be line-to-line type.
3. A silicon rectifier in the control box shall convert alternating current (ac) voltage to dc to power the motor.

3.4.2 Drive unit. The drive unit for the wiper shall include a dc motor and a drive mechanism that converts the rotary motion of the motor shaft into the back-and-forth motion necessary for wiper operation. Both the motor and the mechanism shall be housed in a dripproof protected enclosure. The enclosure shall have a drain fitting on the side for condensation drainage.

3.4.3 Controllers. Control equipment shall be in accordance with MIL-C-2212 (except an autotransformer may be used), and shall have the following characteristics:

Enclosure	Dripproof protected (shall be in accordance with MIL-E-2036)
Rating	Output 115 volts, dc and input 120 volts, ac, 60 hertz (Hz) (input power shall be in accordance with MIL-STD-1399, section 300)
Operation Type	Manual
Function	Full voltage Motor starting, speed regulation and heating element control
Protection Service	Overload C
Motor speed control range	See 3.3.5
Openings for electrical cable entrance	None, user to drill as required
Indicator light (two)	Heated arm energized

3.4.4 Control equipment. Control equipment, by means of a variable transformer and a full wave bridge silicon rectifier in accordance with MIL-E-917, shall convert 115 volts, ac 60 Hz input power to approximately 115 volts, dc full wave power for motor operation. Dc supplied wiper drive motor shall have a form factor of 1.1 or less. Drive motor and controller box shall be grounded individually.

3.4.5 "ON"and "OFF" power switches. Each wiper shall be provided with a double pole toggle (control) switch. The wiper control switch shall be marked with positions "ON" and "OFF" and "PARK". In the PARK position, the control switch shall be turned on and off momentarily to set wiper blade in desired position so as not to obstruct normal vision through the viewing area. Heater control switch shall be marked "ON" and "OFF".

3.4.6 Protection. Overload and short circuit protection for the control equipment shall be as follows:

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- (a) Circuit breaker in heater circuits.
- (b) Wiper motor shall be protected by an overload circuit breaker, the amperage rating of the circuit breaker to be approximately 10 percent over the running amperage rating of motor sufficient to protect the motor from burn-out. Circuit breakers shall be single pole.

3.4.6.1 Protection method used shall prevent motor in a 50 degrees Celsius ($^{\circ}\text{C}$) ambient from exceeding the following values:

<u>Motor insulation class</u>	<u>Maximum temperature rise (locked rotor) $^{\circ}\text{C}$</u>
B	130
F	155
H	180

3.4.7 Heater. Heater shall be watertight and controlled by a double pole toggle switch. Heater circuit shall operate on 115 volts, ac, 60 Hz single phase. Heater shall be contained within the "L" portion of the wiper drive arm assembly. With wiper in static position a temperature reading taken at the outside metal casing shall be between 300 and 350 $^{\circ}\text{F}$ at an ambient temperature of 72 $^{\circ}\text{F}$. Slip-rings shall not be used to supply electrical power to reciprocating arm heater. A heater indicator light shall show when heater is in operation. The light shall be mounted near the corresponding heater power switch. The light shall be illuminated when the heated arm is energized. Lens color shall be red, and lamp and lampholder shall have a built-in resistor, and shall conform to the requirements of MIL-L-3661, MIL-L-3661/8 and MIL-L-3661/14.

3.4.7.1 Wiper arm pivot heaters. Wiper arm pivot for multiblade type wipers shall be provided with a strip heater approximately 55 to 75 watts at 115 volts ac to prevent ice accumulation. Pivot heaters shall be provided on a hinged bracket with a shielded (metal encased) cable lead approximately 3 feet in length. Users will provide bulkhead gland for cable entrance and mounting pad to fasten pivot heater to ship's structure adjacent to area to be heated. Interior mounted wiper drive assemblies which have an exterior pivot heater shall be constructed so as not to interfere with wiper blade. When window is opened it shall be possible for arms to extend outward without mechanical damage. Heaters installed as one unit shall be connected to one heater switch in wiper control box. Total heater currents shall be used in calculating circuit protection for that system.

3.4.8 Wiring. Permanent internal wiring shall be copper. The size, stranding insulation and spacing shall be mechanically and electrically suited to the applications. Wires exposed to heat shall be insulated with 105 $^{\circ}\text{C}$ thermoplastics and outer braid. The minimum wire size shall be AWG #18.

3.4.9 Terminating electrical wires. Connections in the wiper drive assembly and control box shall be soldered, except those terminating at terminal blocks. Wires at terminal blocks shall be terminated with preinsulated compression (crimps) type connectors in accordance with MIL-T-7928, type II, and shall firmly and completely grip the conductor and the wire insulation.

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3.4.10 Wiring diagram and markings.

3.4.10.1 Control box. Terminal board connections shall be identified as follows:

Terminal point:

#1 Black (-)	- to wiper motor
#2 Red (+)	- to wiper motor
#3 Heater circuit	- arm heater
#4 To ship's supply	- 115 volts, ac, 60 Hz
#5 To ship's supply	- 115 volts, ac, 60 Hz
#6 Heater circuit	- arm heater

3.4.10.2 Wiper assembly. Terminal board connections shall be identified as follows:

Terminal point

#1 Black (-)	- wiper motor
#2 Red or white (+)	- wiper motor
#3 Heater circuit	- arm heater
#4 Heater circuit	- arm heater

Wiper assembly shall contain a wiring diagram in control box. Switches, controls, and components shall be properly marked, identified, and functions indicated. Examples "SPEED LO-HI" increasing in a clockwise direction, also "HEATER" switch "OFF" and "ON" with a note clearly stating "UNDER ICING CONDITIONS CLOSE HEATER SWITCH 15 MINUTES BEFORE OPERATING WIPER."

3.5 Performance. Each wiper shall withstand the performance tests specified in 4.4 and shall operate under the following conditions:

- Relative humidity to 100 percent, including conditions wherein condensation takes place in the form of both water and frost.
- Winds up to 40 knots and ice accumulation rate of 6 inches per hour when installed on electrically heated window.
- Exposure to salt-sea atmosphere as specified in method 509.2 of MIL-STD-810.
- Exposure to ultra-violet rays of the sun in accordance with method 7311 of FED-STD-601 (rubber)

3.6 Identification plates. The identification plate shall be as specified in MIL-P-15024 and MIL-P-15024/5 and contain the following information:

- Electric window wiper.
- Manufacturer's name and address.
- Manufacturer's type or drawing number.
- Serial number.
- National stock number, if required (see 6.2).
- Year of manufacture.
- Contract or order number.

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- (h) Technical manual number.
- (i) Allowance parts list number (APL) to be furnished by contracting activity.
- (j) Component identification (CID) number, if available (see 6.2).

3.7 Workmanship. The windshield wiper assemblies shall comply with the workmanship criteria of requirement 9 of MIL-STD-454.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of the manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- (a) First article inspection (see 4.3).
- (b) Quality conformance inspection (see 4.4).

4.3 First article inspection. First article inspection shall consist of the examinations specified in 4.5 and the tests specified in 4.6 (see 6.3).

4.4 Quality conformance inspection. Quality conformance inspection shall consist of the group A, B, C, and D inspections as follows (see 6.3):

4.4.1 Inspection lot. An inspection lot shall be as defined in MIL-STD-105 and shall include the complete assembled window wiper system as defined in 3.2.1.

4.4.2 Sampling for group A inspection. Sampling and inspection shall be in accordance with MIL-STD-105. Major and minor defects shall be classified in accordance with MIL-STD-252.

4.4.2.1 Group A inspection. Group A inspection shall consist of the examination and tests specified in table II.

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TABLE II. Group A inspection.

Inspection	Requirement	Inspection
Visual and dimensional examination (wiper assembly)	3.2.1 through 3.2.1.7, 3.3.1 through 3.3.11, 3.4.1, 3.4.10, 3.6, 3.7	4.5
Visual and dimensional examination (controller)	3.4.1 through 3.4.10	4.5
Functional test	3.3 through 3.3.5	4.6.1

4.4.3 Sampling for group B tests. Sampling shall be in accordance with MIL-STD-105 for special inspection levels.

4.4.3.1 Group B tests. Group B tests shall consist of the tests specified in table III. The tests shall be performed on sample units that have been subjected to and have passed group A inspection unless it is more practical to select a separate sample.

TABLE III. Group B tests.

Tests	Requirement	Test
Room temperature	3.5	4.6.2
Low temperature	3.5	4.6.3
Power interruptions	3.5	4.6.4

4.4.3.2 Disposition of sample units. Sample units which have passed the group B tests shall be delivered on the contract or order.

4.4.4 Sampling for group C tests. One wiper assembly shall be selected from every 12 month's production. The first sample selected shall be at the start of the contract from the first quality conformance inspection lot.

4.4.4.1 Group C tests. Group C tests shall consist of the tests specified in table IV. The tests shall be performed on sample units that have been subjected to and have passed group A inspection. The sample window wiper assembly containing one or more defects shall not be offered for delivery.

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TABLE IV. Group C tests.

Tests	Requirement	Test
Endurance	3.5	4.6.5
Parking operation	3.5	4.6.5.1

4.4.4.2 Disposition of sample units. Sample units which have been subjected to the group C tests shall not be delivered on the contract or order.

4.4.5 Sampling for group D tests.

4.4.5.1 Subgroup 1. One sample unit shall be selected once every 6 months from 6 month's production. The first sample selected shall be at the start of the contract from the first quality conformance inspection lot.

4.4.5.2 Subgroup 2. One sample unit shall be selected every 24 months or whenever the basic design or a vital part of the equipment has been changed. The first sample selected shall be at the start of the contract from the first quality conformance inspection lot.

4.4.5.3 Group D tests. Group D tests shall consist of the tests specified in the sequence shown for each subgroup in table V. Group D tests shall be performed on sample units that have passed group B tests. Shipment shall not be held up pending results of the tests.

TABLE V. Group D tests.

Tests	Requirement	Test
<u>Subgroup 1</u>		
Water spray	3.5	4.6.6
Salt water immersion	3.5	4.6.7
Dry glass	3.5	4.6.8
Motor protection	3.4.6.1	4.6.9
Heated arm	3.4.7	4.6.10
<u>Subgroup 2</u>		
EMI reduction	3.2.5	4.6.11
Airborne noise measurements	3.2.4	4.6.14
Vibration	3.2.2	4.6.12
Shock	3.2.3	4.6.13

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4.4.5.4 Disposition of sample units. Sample units which have been subjected to subgroup 2 of group D tests shall not be delivered on the contract or order.

4.4.5.5 Noncompliance. If a sample fails to pass group D tests; the contractor shall take corrective action on the material or process, or both, and on all units of product which can be corrected and which were manufactured under essentially the same conditions; with essentially the same materials, processes, etc. and which are considered subject to the same failure. Acceptance of the product shall be discontinued until corrective action acceptable to the Government has been taken. After corrective action has been taken, group D tests shall be repeated on additional sample units (all inspections, or the inspection which the original sample failed, at the option of the Government.) Group A and B inspection may be reinstated; however, final acceptance shall be withheld until group D reinspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure and the corrective action taken shall be furnished the contracting officer.

4.5 Visual and dimensional examination.

4.5.1 External. Wiper assembly and controller shall be examined to verify that the materials, external design and construction, physical dimensions, marking, and workmanship are in accordance with the applicable requirements (see 3.2, 3.3, 3.4 and 3.7).

4.5.2 Internal. Wiper assembly and controller shall be disassembled and examined to verify that the materials, internal design and construction, and workmanship are in accordance with the applicable requirements (see 3.2, 3.3, 3.4 and 3.7).

4.6 Test methods.

4.6.1 Functional test. Window wiper system shall be tested for lubricant leaks, maximum blade speed, maximum blade travel, and power consumption. Nonconformance shall be cause for rejection.

4.6.2 Room temperature test. Sample wipers shall be mounted on a test stand and operated at room temperature 70 to 85°F rated ac voltage at a speed of approximately 200 strokes per minute with the wiper blade at normal pressure against a wet glass for a period of 2 hours. The window shall be continuously sprayed with fresh water during the test. At no time during the test shall the motor frame exceed a temperature rise of 50°C and the gear case exceed a temperature rise of 70°C. Any wiper in the sample failing the operation test shall be cause for rejection of the lot.

4.6.3 Low temperature test. Sample wipers shall be operated in a cold room maintained at a temperature of 20°F, using a neoprene rubber wiper blade. An electrically heated window in accordance with MIL-W-18445 shall be used in connection with this test. The electrically heated window and wiper arm pivot heater should be turned on approximately 15 minutes before the test and shall

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remain on for the test. A spray of fresh water shall be sprayed on the glass and the wiper operated for 30 minutes to determine its effectiveness in cold weather for removing rain and spray. Window wiper arm and pivot joint heater shall be examined for freedom from ice formation. Malfunction or ice formation shall be cause for rejection.

4.6.4 Power interruptions. Window wiper systems shall be subjected to the following tests:

- (a) With speed control set at high (fast speed), disconnect power source from control box. Reapply power. Repeat five times.
- (b) Repeat above test with speed control set at low (slow speed). No malfunctioning shall occur during or after test. Time between applying and removing power shall be approximately 10 seconds.

4.6.5 Endurance test. One wiper shall be operated at room temperature ranging from 70 to 85°F at a speed of 200 strokes per minute for a period of 1000 hours. Total length of arm from center of clevis bracket to center of wiper arm assembly shall be approximately 20 inches in length. A neoprene rubber wiper blade 16 inches long shall be attached to arm. Sweep angle shall be adjusted for a 60 to 70 degree sweep. A spray of 4 percent salt water solution (5.28 ounces of sodium chloride per gallon of water) shall be sprayed on the wiper and the glass throughout the test. Malfunction, loose parts, erratic operation, or appearance of corrosion shall be cause for rejection.

4.6.5.1 Parking operation test. At the end of the endurance test (1000 hour period) (see 4.6.5), the window wiper system shall be tested for parking operation. This shall consist of a minimum of 100 cycles of parking operation at 5 second intervals. One cycle shall consist of operating the control from "OFF" to "PARK" and back to "OFF". If automatic park is available, one cycle shall consist of turning control from "ON" to "OFF" (auto-park position) and back to "ON". Blade may be parked to right or left side alternately. Any malfunction during test shall constitute a failure.

4.6.6 Water spray test. Window wiper drive housing assembly shall be mounted in a horizontal position (similar to usual installation position) and subjected to the following test:

- (a) With power applied and wiper operating, at least 65 gallons per minute (gal/min) of fresh water from a 1-inch nozzle shall be sprayed on the wiper drive housing at a distance not less than 10 feet for 5 minutes. Any malfunction of the system shall constitute a failure.

4.6.7 Salt water immersion test. Window wiper drive housing assembly for outboard installation shall be totally immersed in a tank of 4 percent salt solution at an approximate temperature of 70°F for a period of 5 minutes. After immersion test, voltage shall be applied to the wiper and it shall operate without malfunction. Wiper housing assembly shall then be opened and examined for presence of water. Amount of water in housing shall not exceed 5 cubic centimeters (cm³). Note: During immersion test, cable openings may be sealed. This test is not required for housing assemblies that are to be installed inboard.

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4.6.8 Dry glass test. Wiper shall be operated on a dry window glass for 15 minutes or until the circuit breaker is activated to protect the motor at a speed of 200 strokes per minute without damage to the wiper. At the end of the test, wiper mechanism shall be disassembled and examined for wear and condition of lubrication. During above test, wiper blade may leave a minimal deposit of rubber on glass surface. Wiper blade may not scratch glass.

4.6.9 Motor protection test. The motor protection test shall be conducted as follows:

- (a) Place thermocouple or thermometer in contact with the stator insulation.
- (b) Record ambient temperature.
- (c) Energize motor via control equipment with motor shaft prevented from rotating for 1 minute.
- (d) Set speed control knob for minimum speed.
- (e) Observe motor temperature rise and control equipment protective device for compliance with the requirements specified in 3.4.6.1.
- (f) Repeat at midpoint setting of motor speed control.

4.6.10 Heated arm test. Drive arm assembly containing an encased electrical heating element shall be tested as follows:

- (a) While arm is clamped to a test fixture, 115 volts ac, 60 Hz power shall be applied to the heating element for a period of approximately 15 minutes. After this period of time a temperature indicating device shall be used to measure temperature of heated arm. Temperature shall comply with the requirements specified in 3.4.7.
- (b) While arm is hot and power removed, arm except leads shall be immersed in a tank of fresh water for a period of 10 minutes. After this period of time a megger reading (insulation reading using a 500 volt instrument) shall be taken between each lead and metal case. Readings shall be 5 megohms or greater.

4.6.11 EMI emission and susceptibility. EMI emission and susceptibility tests shall be in accordance with MIL-STD-462. Performance shall be in compliance with the requirements of 3.2.5.

4.6.12 Vibration test. The first of identical units selected at the start of the contract from the first quality conformance inspection lot shall be tested in accordance with MIL-STD-167-1, type I vibration. Note: The type I vibration tests require that equipment be tested and that resonances be noted. Resonance is defined as that condition under which the vibration amplitude of the equipment under test is equal to or greater than 2.0 times the vibratory displacement values noted in amplitudes table of MIL-STD-167-1. The total resonant frequency endurance test time shall be at least 2 hours. Thus, if a total of 12 resonant frequencies, as defined herein, are noted for the three test orientations, each of the 12 frequencies shall be endurance tested for at least 10 minutes.

4.6.13 Shock test. Window wiper system shall be shock tested in accordance with MIL-S-901, grade B. After completion of the test, the system shall be examined to determine that it conforms to grade B requirements.

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4.6.14 Airborne sound measurements test. Airborne sound measurements tests shall be conducted simultaneously with all quality conformance tests requiring operation of the equipment in accordance with test methods specified in 4.6. Unless otherwise specified, the wiper system shall be operated between a low speed and a high speed (see 3.3.5) alternately to determine compliance with 3.2.4, while wetted down and dry for 15-minute periods as applicable. Sound measurement data shall be recorded before, during and at the finish of each operating period. Failure to conform to the requirements of 3.2.4 shall constitute failure of the test.

4.6.14.1 Acceptance criteria. Airborne noise acceptance criteria are defined in terms of octave band sound pressure levels (see table I) that each item of equipment may be permitted to generate while operating at the maximum speed condition.

4.6.14.2 Octave band analysis instruments. Octave band sound pressure levels shall be measured with an omni-directional microphone and sound level meter conforming to ANSI S1.4 and ANSI S1.11, type E, class II (modified to conform to frequencies of S1.6), respectively (see 6.7). A combined sound level octave band analyzer conforming to the above requirements may be used. If tape recorders are used to preserve the broad-band noise output of transducers for later analysis, the complete system shall have a response known within plus or minus 2 dB over the required frequency range.

4.6.14.3 Airborne acceptance criteria. The octave band sound pressure levels specified in table I shall be used as a basis of acceptance for airborne noise equipment. The contractor may perform narrower band analysis to identify any offending frequencies to aid in his corrective measures.

4.6.14.4 Mounting equipment for test. For airborne measurements, equipment shall be oriented in a normal operating position. Resilient mounts may be used for the test. The vertical natural frequency of the mounted assembly shall be less than, or equal to, 1/4 of the lowest forcing frequency within the equipment. Resilient mountings conforming to MIL-M-17191, MIL-M-17508, MIL-M-19379, MIL-M-19863, or MIL-M-21649 shall be used where possible. The complete assembly shall be supported on reinforced concrete or cast metal floor in direct contact with the ground. Any pedestals required to accommodate the resilient mountings shall be of steel reinforced concrete. If mountings specified above cannot be used, the mountings used shall be in accordance with MIL-M-17185, and the command or agency concerned shall be advised of their use prior to the test.

4.7 Inspection of packaging. Sample packs, and the inspection of the preservation, packing and marking for shipment, stowage and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging requirements of referenced documents listed in section 2, see 6.9.)

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5.1 Packaging requirements. Window wipers, accessories, attachments, manuals, and repair parts shall be preserved level A, C, or commercial, packed level A, B, C, or commercial as specified (see 6.2) and marked in accordance with MIL-STD-794 or MIL-STD-2073-1, or MIL-E-17555 and shall include bar codes and applicable packaging acquisition options therein as specified (see 6.2). In addition for Navy acquisitions, the following applies:

(a) Navy shipboard stowage fire-retardant requirements.

- (1) Treated lumber and plywood. When specified (see 6.2), all lumber and plywood including laminated veneer material used in shipping containers and pallet construction, members, blocking, bracing, and reinforcing shall be fire-retardant treated material conforming to MIL-L-19140 as follows:

Levels A and B - Type II - weather resistant.

Category 1 - general use.

Level C - Type I - non-weather resistant.

Category 1 - general use.

- (2) Fiberboard. When specified (see 6.2), fiberboard used in the construction of class-domestic, non-weather resistant fiberboard and cleated fiberboard boxes including interior packaging forms shall meet the flamespread and the specific optic density requirements of PPP-F-320.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Window wiper systems covered by this specification are intended to be used for clearing exterior surfaces of windows and windshields on ship's bridge, signal shelter, and other areas in ordinary and freezing weather conditions.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- (a) Title, number, and date of this specification.
- (b) Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- (c) When first article inspection is required (see 3.1).
- (d) Mounting of wiper drive housing assembly either inboard or outboard (see 3.3.1).
- (e) Length of lower wiper arm assembly if other than overall length of 20 inches is desired (see 3.3.4.1).
- (f) Blade size required if other than 12 inches in length (see 3.3.4.2.1).
- (g) National stock number, if required (see 3.6).

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- (h) Component identification number (see 3.6).
- (i) When fire-retardant treated materials are not required (see 5.1).
- (j) Level of preservation, packing and marking required (see 5.1).

6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DID's) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DID's are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DoD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

<u>Reference Paragraph</u>	<u>DID Number</u>	<u>DID Title</u>	<u>Suggested Tailoring</u>
3.2.1, 3.3.4.1	DI-E-7031	Drawings, engineering and associated lists	Level 3
4.3	DI-T-4902	First article inspection report	----
4.4	DI-T-5329	Inspection and test reports	----

The above DID's were those cleared as of the date of this specification. The current issue of DoD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DID's are cited on the DD Form 1423.

6.4 Technical manuals. The requirement for technical manuals should be considered when this specification is applied on a contract. If technical manuals are required, military specifications and standards that have been cleared and listed in DoD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL) must be listed on a separate Contract Data Requirements List (DD Form 1423), which is included as an exhibit to the contract. The technical manuals must be acquired under separate contract line item in the contract.

6.5 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerors whether the item(s) should be a preproduction sample, a first article sample, a first production item, a sample selected from the first ___ production items, a standard production item from the contractor's current inventory (see 3.1), and the number of items to be tested as specified in 4.3. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

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6.6 Acceptable Quality Level (AQL) information.

6.6.1 AQL for group A inspection. The AQLs should be as specified in table VI.

TABLE VI. AQLs for group A inspection.

Inspection	AQL defect per hundred units	
	Major	Minor
Visual and dimensional examination (wiper assembly)	1.0	4.0
Visual and dimensional examination (controller)	1.0	4.0
Functional test	2.5 percent level I	---

6.6.2 AQL for group B tests. Inspection levels and AQLs should be as specified in table VII.

TABLE VII. AQLs for group B tests.

Tests	AQL percent defective	Inspection level
Room temperature	4.0	S-4
Low temperature	4.0	S-4
Power interruptions	4.0	S-4

6.7 Octave band instruments. If older instruments conforming to ANSI Z24.3 and ANSI Z24.10, respectively, are on hand, these may be used.

6.8 Provisioning. Provisioning Technical Documentation (PTD), spare parts, and repair parts should be furnished as specified in the contract.

6.8.1 When ordering spare parts or repair parts for the equipment covered by this specification, the contract should state that such spare parts and repair parts should meet the same requirements and quality assurance provisions as the parts used in the manufacture of the equipment. Packaging for such parts should also be specified.

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6.9 Sub-contracted material and parts. The packaging requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.10 Subject term (key word) listing.

Blade
Heaters, arm pivot.

6.11 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Navy - SH
Air Force - 99

Preparing activity:

Navy - SH
(Project 2090-0095)

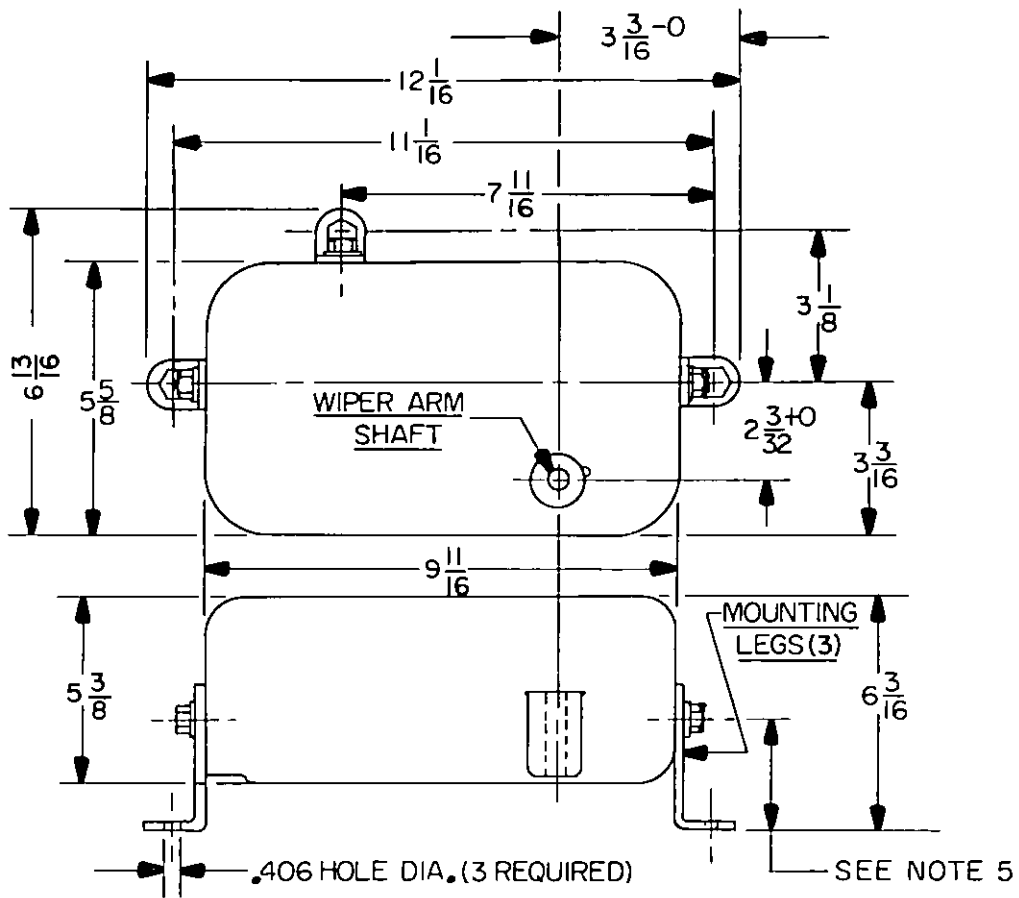
Review activities:

Navy - SH
Air Force - 85,

User activities:

Army - ME
Navy - CG

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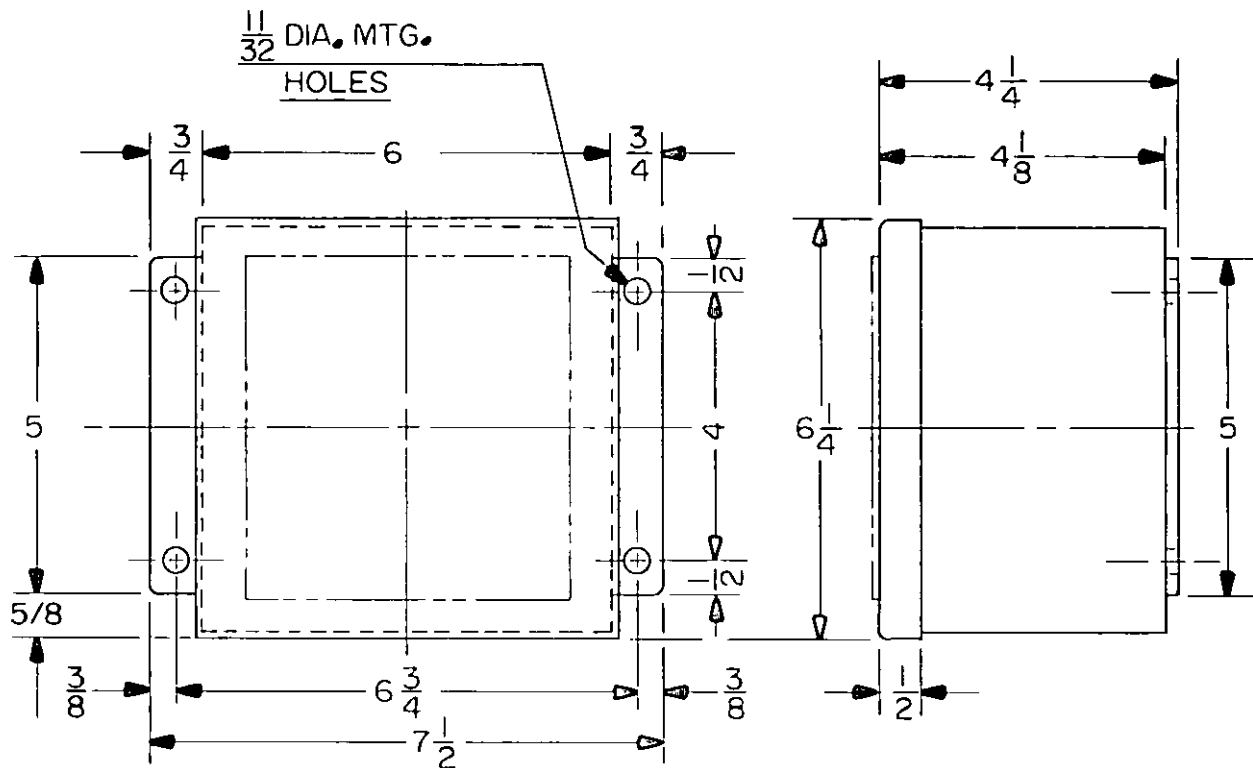


NOTES:

1. All dimensions in inches.
2. Tolerances plus or minus $1/32$.
3. Three brackets shall be provided on three sides of wiper motor housing, except the side where the wiper are protrudes.
4. Bracket mounting holes shall be according to manufacturer's mounting location but shall provide secure mounting against shock and vibration requirements.
5. Length of mounting bracket legs shall not exceed 4-1/2 inches but shall be long enough for the wiper arm shaft to move freely.

FIGURE 1. Wiper housing envelope dimensions.

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NOTES:

1. All dimensions in inches.
2. Tolerances plus or minus $1/32$.
3. Bracket mounting holes shall be according to manufacturers's mounting location but shall provide secure mounting against shock and vibration requirements.

FIGURE 2. Single control box mounting holes and envelope dimensions.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER

MIL-W-3459D

2. DOCUMENT DATE (YYMMDD)

3. DOCUMENT TITLE

WIPERS, WINDOW, ELECTRIC, PENDULUM TYPE (MARINE SERVICE, HEAVY DUTY)

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)

(1) Commercial

(2) AUTOVON

(if applicable)

7. DATE SUBMITTED

(YYMMDD)

8. PREPARING ACTIVITY

a. NAME Technical Point of Contact (TPOC):

Mr. Marlene Rowe (NAVSSSES 074)

PLEASE ADDRESS ALL CORRESPONDENCE AS FOLLOWS:

b. TELEPHONE (Include Area Code)

(1) Commercial

(2) AUTOVON

TPOC: (215) 897-7957

443-7957

c. ADDRESS (Include Zip Code)

Commander, Naval Sea Systems Command
 Department of the Navy (SEA 5523)
 Washington, DC 20362-5101

IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:

Defense Quality and Standardization Office
 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466
 Telephone (703) 756-2340 AUTOVON 289-2340